

REMARKS

By this Amendment, Applicant amends claims 1, 2, and 9 to more clearly define the invention. Thus, claims 1-11 remain pending.

In the last Office Action, the Examiner objected to the drawings and specification; objected to the Abstract; objected to claims 1, 2 and 9; rejected claims 1 and 2 under 102(b) as anticipated by U.S. Patent No. 5,568,257 to Ota et al. ("Ota"); rejected claims 3-8 under 35 U.S.C. § 103(a) as unpatentable over Ota in view of U.S. Patent No. 4,758,864 to Endo et al. ("Endo") in view of U.S. Patent No. 5,863,712 to Von Bunau et al. ("Von Bunau"); and rejected claims 9-11 under 35 U.S.C. § 103(a) as unpatentable over Ota in view of Von Bunau.

Regarding the objection to the drawings and specification for allegedly not describing reference numeral 2 in Fig. 11, Applicant has amended the specification to further clarify that reference numeral 2 refers to a lighting lens. The specification for the present invention describes at page 11, lines 20-24 that "light emitted from the halogen lamp 1 passes through a lighting lens 2." Thus, the specification previously described reference numeral 2 as a lighting lens, and no new matter has been added by this Amendment. Accordingly, the objection to the drawings and specification should be withdrawn.

Regarding the objection to the Abstract, Applicant amends the Abstract to form a proper sentence. Accordingly, the objection to the Abstract should be withdrawn.

Regarding the objection to the claims, Applicant amends the claims 1, 2 and 9 to more clearly define the invention. Accordingly, the objection to claims 1, 2, and 9 should be withdrawn.

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The rejection of claims 1 and 2 as anticipated by Ota under § 102(b) is respectfully traversed for the following reasons.

In order to properly anticipate Applicant's claimed invention under 35 U.S.C. § 102, the Examiner must show that each and every element of each of the claims in issue is found, either expressly described or under principles of inherency, in a single prior art reference. Furthermore, "[t]he identical invention must be shown in as complete detail as is contained in the ... claim." See M.P.E.P. §2131, page 2100-69, 8th Ed., August 2001, quoting *Richardson v. Suzuki Motor Co.*, 868 F.2d 1126, 1236, 9 U.S.P.Q.2d 1913, 1920 (Fed. Cir. 1989). Further, "the elements must be arranged as required by the claim." M.P.E.P. §2131, p. 2100-69.

Regarding the rejection of claims 1 and 2 under § 102(b) over Ota, claim 1 recites a method for measuring the displacement of an optical axis of an optical microscope use in lithography in semiconductor processing. In contrast, Ota relates to an alignment apparatus for aligning a mask or reticle with a photosensitive substrate. (See Col. 1, lines 11-18.) The aligning apparatus of Ota is an optical system aimed at guiding a light beam to a detector to obtain phase information of diffracted light from an alignment mark.

Ota does not teach each and every element of the claim. Particularly, Ota does not teach at least "a step of measuring the displacement of the optical axis based upon the relationship between the brightness of an image of the evaluation mark and a direction of the diffraction grating patterns of the evaluation mark," as recited in claim 1. Instead, Ota describes at col. 20, lines 34-37 calculating a rotational error of the interference fringes with respect to the diffraction grating mark on the basis of the phase

difference information. Because Ota does not “measuring the displacement of the optical axis based upon the relationship between the brightness of an image of the evaluation mark and a direction of the diffraction grating patterns of the evaluation mark,” Ota does not teach each and every element of claim 1, and the rejection should be withdrawn. The rejection of claim 2 should be withdrawn as well, at least in view of its dependence from claim 1.

To establish a *prima facie* case of obviousness under 35 U.S.C. §103, each of three requirements must be met. First, the reference or references, taken alone or combined, must teach or suggest each and every element recited in the claims. (See M.P.E.P. §2143.03 (8th ed. 2001).) Second, a reasonable expectation of success must exist. Third, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to combine the references in a manner resulting in the claimed invention. Moreover, each of these requirements must “be found in the prior art, and not based on applicant’s disclosure.” (M.P.E.P. §2143 (8th ed. 2001).)

The rejection of claims 3-8 under 35 U.S.C. § 103(a) as unpatentable over Ota, Endo, and Von Bunau is respectfully traversed, since a *prima facie* case of obviousness has not been made by the Examiner.

Claims 3-8 depend from claim 1. Applicant already pointed out that Ota lies in a different field of art than the present invention and therefore constitutes nonanalogous art. It is improper to combine references which are nonanalogous fields in an effort to fashion an obviousness rejection. (MPEP 2141.01(a)).

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Further, Ota does not teach or suggest at least an "a step of measuring the displacement of the optical axis based upon the relationship between the brightness of an image of the evaluation mark and a direction of the diffraction grating patterns of the evaluation mark," as recited in claim 1 and required by claims 3-8. (See above discussion in connection with the traversal of the § 102(b) rejection of claim 1 over Ota.)

Endo and Von Bunau taken singly or combined also fail to cure the deficiencies of Ota. Endo discloses a projecting exposure apparatus for projecting a reticle (a mask) onto the surface of the wafer. And Von Bunau discloses another pattern forming method. Neither Endo nor Von Bunau teach or suggest at least a step of measuring the displacement of the optical axis based upon the relationship between the brightness of an image of the evaluation mark and a direction of the diffraction grating patterns of the evaluation mark," as recited in claim 1.

Because Ota, Endo and Von Bunau, taken singularly or in combination, do not teach or suggest all of the claim elements, the Examiner has not met an essential criteria for establishing a *prima facie* case of obviousness.

Furthermore, because a combination of Ota, Endo and Von Bunau fails to teach or suggest all of the claim elements, there can be no motivation in Ota, Endo and Von Bunau to modify them to produce Applicant's claimed invention. Further, because combining the references still would not produce Applicant's claimed invention, there cannot be any reasonable expectation of success derived from the combination of these references. One skilled in the art would only arrive at the present claimed invention by consulting Applicant's disclosure. Therefore, the only way to construct the claimed

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invention from the cited references would be to rely on aspects related to the present invention. Such reliance, however, would constitute improper hindsight reasoning.

Since Applicant has already established that the applied references do not teach or suggest all the elements of Applicant's claims 3-8, that they cannot be modified to produce the present invention, and that there would be no reasonable expectation of success derived from so combining, Applicant submits that, at least according to the M.P.E.P., the Examiner's reliance on Ota, Endo and Von Bunau is not sufficient to establish *prima facie* obviousness over Applicant's dependent claims 3-8. Therefore, claims 3-8 are allowable over a combination of Ota, Endo and Von Bunau, and Applicant respectfully submit that the Examiner should withdraw the 35 U.S.C. § 103(a) rejection of claims 3-8.

Applicant also traverses the rejection of claims 9-11 under 35 U.S.C. § 103(a) as unpatentable over Ota and Von Bunau.

Claim 9 recites an optical microscope comprising, in part, "a removable and rotatable shield means provided at a pupil of the projection optical system and having a shield area, the shield area being asymmetric relative to normal light of the illumination light from a substrate."

As described above, Ota relates to an alignment apparatus for aligning a mask, not an optical microscope. Because Ota is nonanalogous art, it is improper for the Examiner to apply it against the claims of the present application in an obviousness rejection.

In addition, as correctly admitted by the Examiner at page 6 of the Office Action, Ota does not teach "a removable and rotatable shield means provided at a pupil of the

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projection optical system and having a shield area, the shield area being asymmetric relative to normal light of the illumination light from a substrate," as recited in claim 1.

Von Bunau fails to correct the deficiencies of Ota. The Examiner alleges that Figs. 8a-8c of Von Bunau disclose the claimed shield means. However, this characterization of Von Bunau is incorrect. Instead, Von Bunau discloses in Figs. 8a-8c a shield means with a symmetric shield area. Because Von Bunau does not teach or suggest at least a "shield area being asymmetric," as recited in claim 9, a combination of Ota and Von Bunau fails to disclose each element of claim 9. Thus, the Examiner has not met an essential criteria for establishing a *prima facie* case of obviousness.

Furthermore, because a combination of Ota and Von Bunau fails to teach or suggest all of the claim elements, there can be no motivation in Ota and Von Bunau to modify them to produce Applicant's claimed invention. Further, because combining the references still would not produce Applicant's claimed invention, there cannot be any reasonable expectation of success derived from the combination of these references. One skilled in the art would only arrive at the present claimed invention by consulting Applicant's disclosure. Therefore, the only way to construct the claimed invention from the cited references would be to rely on aspects related to the present invention. Such reliance, however, would constitute improper hindsight reasoning.

Since Applicant has already established that the applied references do not teach or suggest all the elements of Applicant's independent claim 9, that they cannot be modified to produce the present invention, and that there would be no reasonable expectation of success derived from so combining, Applicant submits that, at least according to the M.P.E.P., the Examiner's reliance on Ota and Von Bunau is not

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sufficient to establish *prima facie* obviousness over Applicant's independent claim 9. Therefore, claim 9 is allowable over a combination of Ota and Von Bunau. In addition, dependent claim 10 and 11 are also allowable at least by virtue of their respective dependency from allowable base claim 9. Accordingly, Applicant respectfully submit that the Examiner should withdraw the 35 U.S.C. § 103(a) rejection of claims 9-11.

CONCLUSION

Attached hereto is a marked-up version of the changes made to the claims and specification by this amendment. The attachment is captioned "**Appendix to the Amendment of June 30, 2003.**" Deletions appear as normal text surrounded by [] and additions appear as underlined text.

In view of the foregoing amendments and remarks, Applicant respectfully requests the reconsideration and reexamination of this application and the timely allowance of the pending claims.

Please grant any extensions of time required to enter this response and charge any additional required fees to our deposit account 06-0916.

Respectfully submitted,

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Dated: June 30, 2003

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APPENDIX TO AMENDMENT OF JUNE 30, 2003

Version of Claims with Markings to Show Changes Made

AMENDMENTS TO THE ABSTRACT:

Please amend the abstract as follows:

A method of measuring the displacement of the optical axis of an optical microscope having an illumination optical system and a projection optical system [having] includes a step of irradiating the evaluation mark having diffraction grating patterns formed on a substrate with illumination light by way of the illumination optical system and observing the evaluation mark by way of the projection optical system to obtain the brightness of the evaluation mark, and a step of measuring the displacement of the optical axis on the basis of the relationship between the brightness of the image of the evaluation mark and the direction of the diffraction grating patterns of the evaluation mark.

AMENDMENTS TO THE SPECIFICATION:

Please amend the specification as follows:

On page 19, please replace the paragraph beginning at line 3 with the following:

Fig. 11 is a schematic illustration of the distribution of light at the position of the aperture of the objectives obtained when the microscope of Fig. 10A and 10B is used. The spot of normal light 16 and those of primary diffracted light 17 have a profile similar

to that of the aperture 3 of the lighting lens [3] 2. The ratio of the circle representing the numerical aperture 18 of the projected lens to the radius of the spot of normal light 16 is referred to lighting coherence. It is possible for a microscope with a lighting coherence of about 0.5 to reliably secure a sufficient gap separating the spot of normal light 16 and those of primary diffracted light 17 by selecting an appropriate value for the cycle length of diffraction gratings. Then, the shield section is only required so as to be snugly placed in the gap. Thus, the shield section does not require any rigorous alignment.

AMENDMENTS TO THE CLAIMS:

Please amend claims 1, 2, and 9, as follows:

1. (Amended) A method of measuring [the] a displacement of [the] an optical axis of an optical microscope having an illumination optical system and a projection optical system, the method comprising:

 a step of irradiating [the] an evaluation mark having diffraction grating patterns formed on a substrate with illumination light by way of the illumination optical system and observing the evaluation mark by way of the projection optical system to obtain [the] a brightness of the evaluation mark; and

 a step of measuring the displacement of the optical axis [on the basis of] based upon the relationship between the brightness of [the] an image of the evaluation mark and [the] a direction of the diffraction grating patterns of the evaluation mark.

2. (Amended) The method of measuring the displacement of the optical axis according to claim 1, wherein

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the evaluation mark is composed of at least two gratings connected together and arranged in [a] series with each other, each having parallel bars that extend in a direction different from those of any other grating.

9. (Amended) An optical microscope comprising:

an illumination optical system through which illumination light to be applied to an evaluation mark passes;

a projecting optical system through which the illumination light reflected from the evaluation mark passes; and

a removable and rotatable shield means provided at a pupil of the projection optical system and having a shield area, the shield area [is arranged] being asymmetric[ally] relative to normal light of the illumination light from [the] a substrate.